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ABSTRACT

This study involved the participants of a four-week, National Science Foundation-sponsored workshop who were interested in piloting the life science phase of Science Curriculum Improvement Study (SCIS) materials in six school districts in Northeast Kansas. The purpose of the study was to investigate the progress of participant usage of SCIS and to identify concerns of the participants so that help could be provided. For this purpose, a "Concerns Questionnaire" was administered to the participants before and after the workshop, and was also administered to teachers who had attended the workshop the previous year and had been using SCIS for one year. Among the results of the study were: (1) the teachers who had been using SCIS for one year were less concerned about the management of SCIS than the inexperienced teachers; (2) the workshop participants were more concerned about management of SCIS after the workshop than before the workshop; and (3) there was no difference between the scores of the participants on the instrument "Science Teaching Attitude Scales" before and after the workshop. (MLH)

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In-Service Education: Identifying and Responding To Concerns
of Teachers of Science Curriculum Improvement Study Materials

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A NSF sponsored four-week workshop was held in Lawrence, Kansas from July 7 to August 1, 1975. The 37 participants were interested in piloting the life science phase of SCIS in six school districts in Northeast Kansas. This workshop was a follow-up of a NSF-SCIS physical science workshop funded the previous summer.

The format of the life science workshop included sessions on the rationale and teaching strategies associated with the SCIS program as well as daily teaching experiences with 80 elementary school students involved in a science enrichment program. The participants also received instruction in basic biological principles with an emphasis on outdoor activities including six half-day field trips.

The 1975-76 academic year program was designed to support the individual efforts of the participants. A half-time staff member was assigned to plan monthly meetings, visit teachers in their schools, begin a life science resource center, and be available as needs of teachers were made known.

The evaluation of the workshop included the early identification of the stages of concern expressed by the participants as they planned the implementation of the SCIS life science material. The participants completed the Concerns Questionnaire prior to arriving at the workshop. The Concerns Questionnaire was administered again at the close of the workshop.

An interview technique was also used in conjunction with certain of the administrations of the Concerns Questionnaire to determine the current Level of Use of the SCIS innovation by the participants. This paper will not discuss the Levels of Use data since a final end of the year interview with the participants will not be conducted till April, 1976.

The choice of these complementary instruments was based on a need to systematically plot the progress of participant usage of SCIS and to identify concerns of the participants so that help could be provided. The difficulty in pinpointing the precise nature of the impact of NSF Teacher Institutes has already been documented by Helgeson (1974) in his review of 138 research studies associated with NSF Teacher Institutes.

Gene Hall and the staff of the Research and Development Center for Teacher Education at The University of Texas administered the Concerns Questionnaire and conducted the Levels of Use interviews. The Research and Development staff was interested in further validation of the Concerns-Based Adoption Model proposed by Hall and associates (1975).

The remainder of the paper consists of a brief account of the instruments used, design of the study, sample populations, hypotheses, findings, conclusions, and implications.

Instruments

Concerns Questionnaire

The conceptual basis of the Concerns-Based Adoption Model developed by Hall et al. (1973) was suggested by Fuller (1969) and her associates in their study of concerns of teachers. Fuller identified a developmental sequence in which prospective and inservice teachers' concerns appeared on a continuum from concerns about self to concerns about the task of teaching to concerns about impact on students. Hall and his associates expanded on this developmental sequence and generalized to the Stages of Concern as illustrated in Table 1.

Table 1

Stages of Concern About the Innovation

- 0 UNWARENESS: No indication of interest in or concern about the innovation.
- I INFORMATIONAL: Expresses a general awareness of the innovation and learning more about it. The user seems to be unworried about himself in relation to the innovation. The potential adopter considers substantive aspects of the innovation in a selfless manner inquiring about general characteristics, effects, and requirements for use. Information needs and interest are of a more cursory nature reflecting general non-committal feelings, limited evaluation and minimal personal investment.
- II PERSONAL: Reflects uncertainty about the roles played by the individual user and of the demands placed upon him, including analysis of his role in relation to the reward structure of the organization decision making and consideration of potential conflicts with existing structures or personal commitment that have financial or status implication of the program for self and colleagues may also be expressed.
- III MANAGEMENT: Expressions about the process of using the innovation and the best use of information and resources. The statements focus on issues related to efficiency, organizing, managing, scheduling, and time demands.
- IV CONSEQUENCE: Indications of exploration of impact of the innovation on clients in his immediate sphere of influence. Expressions about relevance for clients, evaluation of client outcomes, including performance and competencies, and how his use of the innovation can be changed to increase client outcomes are stated.
- V COLLABORATION: Focus is on increasing impact on clients through collaboration with others regarding use of the innovation.
- VI REFOCUSING: Indications of user's exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative.

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The Concerns Questionnaire is based on the model in Table 1 and is used to determine the relative concerns of people about the use of a particular innovation. The 35 items reflect the affective perceptions of the user by means of 5 items keyed to each of the seven levels of concern. For example the user would respond on a 0 to 7 scale to the statement: I am concerned about how the innovation affects students.

Level of Use of the Innovation (LoU)

Hall, Loucks, Rutherford, and Newlove (1975) operationally defined eight sequential levels of use of an innovation by an individual. These levels range from a user having little or no knowledge of the innovation to an active, effective use of the innovation including an active search for major modifications or alternatives to the innovation. The LoU Chart in Table 2 describes what the user will be doing at various levels. The LoU Chart is obviously coordinated with the previously described Stages of Concern about the innovation which depicts affective stages of user development.

The Levels of Use of the innovation (LoU) is determined by use of a branching format interview as described by Loucks and her colleagues (1976). In the present study, each workshop participant was interviewed for 20 to 30 minutes at the beginning of the summer workshop, in October, 1975, and again in January, 1976. The final LoU interview is slated for April, 1976. The sequence of interviews will provide a repeated measure of changes in levels of usage from the pre-workshop through the following year of teaching SCIS science in the schools.

TABLE 2
Levels of Use of the Innovation

LEVELS OF USE	DEFINITION OF USE
O NONUSE	State in which the user has little or no knowledge of the innovation, no involvement with the innovation and is doing nothing toward becoming involved.
I ORIENTATION	State in which the user has recently acquired or is acquiring information about the innovation and/or has recently explored or is exploring its value orientation and its demands upon user and user system.
II PREPARATION	State in which the user is preparing for first use of the innovation.
III MECHANICAL USE	State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.
IVA ROUTINE	Use of the innovation is stabilized. Few, if any, changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.
IVB REFINEMENT	State in which the user varies the use of the innovation to increase the impact on clients within the immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.
V INTEGRATION	State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.
VI RENEWAL	State in which the user reevaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

Science and Science Teaching Attitude Scales

The attitude instrument used in this study combined the six scales developed by Moore (1973) and two of the scales developed by Moore and Sutman (1970). This procedure of combining the scales of the Science Teaching Attitude Scales with selected scales from the Scientific Attitude Inventory was suggested in the article by Moore (1973).

According to the model used to develop both instruments, the "p" scales represent positive positions, and the "n" scales represent negative positions. There are five items to assess each scale with each item having a scoring range from 0 to three. Complete acceptance of a positive position and complete rejection of the related negative position would result in a score of 15 for each of the two scales.

The eight scales selected for this study include:

- 2-P Observation of natural phenomena is the basis of scientific explanation. Science is limited in that it can only answer questions about natural phenomena and sometimes it is not able to do that.
- 2-N The basis of scientific explanation is in authority. Science deals with all problems and it can provide correct answers to all questions.
- 5-P The idea of teaching science is attractive to me; I understand science and I can teach it.
- 5-N I do not like the thought of teaching science.
- 6-P There are certain processes in science which children should know, i.e., children should know how to do certain things.
- 6-N There are certain facts in science that children should know.
- 7-P Science teaching should be guiding or facilitating of learning. The teacher becomes a resource person.
- 7-N Science teaching should be a matter of telling children what they are to learn.

Moore (1973) described the development of the Science Teaching Attitude Scales and provided an analysis of the field test of six scales of the instrument in a pre and posttest study of 31 teachers in a SCIS

four-week summer workshop. The significant differences between pre and posttest total scores were attributed to significant gains on the 5-P, 5-N, 6-N and 7-N scales as defined above.

SCIS Institute Reactionnaire

Rowe and Hurd (1966) described an engineering research approach for use in inservice programs to diagnose specific sources of resistance to innovation. In Rowe's study, the participants evaluated each session on two, 3-part scales: Not Interesting; Interesting; Very Interesting; and Not Useful; Useful; and Very Useful. In the present study, a similar set of scales were used as a post-workshop instrument for the purpose of obtaining a ranking of the five major activities of the workshop.

Levels of Use Inventory (LoUI)

Webb et al. (1969) stated that although questionnaires and interviews are probably the most flexible and useful methods to gather data, they are not a "methodical sanctuary." Webb advocated the use of observational studies to provide another perspective to the reactive type measures. The Levels of Use Inventory was developed by Joel Colbert (1976) to provide classroom observational data regarding the level of use of SCIS science in the classrooms of the workshop participants after approximately four months of SCIS teaching opportunity.

The LoUI instrument is a checklist with categories to record attendance at monthly workshops, teacher requests for material or information, two classroom observations of on-going science lessons, and a tally of the first three substantive teacher statements and/or questions directed to the observer. The LoUI should prove useful in the future as another dimension of the level of use of an innovation model.

Design of the Study

One of the purposes of this study was to determine if significant changes occurred in the Stages of Concern of teachers toward the SCIS materials as a result of attending NSF-sponsored SCIS workshops. The Science and Science Teaching Attitude Scales and a SCIS Institute Reactionnaire provided additional data on the impact of the 1975 workshop. The Levels of Use Inventory provided descriptive information on the level of use of the SCIS materials in the classrooms of the participants.

Sample Population

The 37 participants in the summer of 1975 included two administrators and 35 teachers representing six school districts in Kansas. Eleven of the participants had attended a four-week workshop the previous summer and had piloted the SCIS physical science materials during the 1974-75 school year. The 31 women and six men in the 1975 workshop piloted the SCIS life science materials during the 1975-76 school year.

Test Schedule

Forty-six teachers equally divided between the 1974 and the 1975 workshop participants completed the Concerns Questionnaire prior to the beginning of the 1975 Workshop. The purpose of this comparison was to determine whether there were significant differences at each of the seven levels of concern when the concerns of SCIS teachers with one year of experience were compared with teachers with no SCIS experience.

A second phase of the study included the administration of the Concerns Questionnaire to 36 1975 workshop participants as a pre-workshop and a post-workshop measure. Eight scales taken from the Science and Science

Teaching Scales instrument were also given to 32 1975 workshop participants as a pre- and post-workshop measure. The SCIS Reactionnaire was given only as a post-workshop measure.

During January, 1976, Levels of Use Inventory data were collected by a staff member as he visited each of 32 teachers on two occasions generally while they were teaching science. The Levels of Use Inventory was an attempt to gather observation data to be used to categorize teachers in the different levels of use as defined by Hall and his associates (1975).

Hypotheses

The following null hypotheses were stated:

1. There are no significant differences between the Stages of Concern of teachers with one year of SCIS teaching experience and teachers with no SCIS teaching experience.
2. There are no significant differences between the pre-workshop and post-workshop Stages of Concern of the 1975 workshop participants.
3. There is no significant difference between the pre-workshop and post-workshop scores on the Science and Science Teaching Attitude Scales.

Results

Null hypothesis₁: There are no significant differences between the Stages of Concern (SOC) scores of teachers with one year SCIS teaching experience and teachers with no SCIS teaching experiences.

The Median Test (Siegel) was used to test whether the two independent groups differed in central tendencies. The results are summarized in Table 3. The decision was to reject the null hypothesis at the .05 level for three of the seven stages. The inexperienced SCIS teachers were

Table 3

Summary of Median Test of Stages of Concern of 28 Experienced Teachers Contrasted with 28 Inexperienced SCIS Teachers

Stages of Concern	χ^2	Decision	Direction
0 Unawareness	1.14	Don't reject H_0	—
I Informational	10.29	Reject H_0 at .005 level	New group more concerned
II Personal	10.83	Reject H_0 at .001 level	New group more concerned
III Management	5.80	Reject H_0 at .02 level	New group more concerned
IV Consequences	0.71	Don't reject H_0	—
V Collaboration	0.57	Don't reject H_0	—
VI Refocusing	0.14	Don't reject H_0	—

significantly more concerned with the stages related to information, personal, and management than the former workshop participants with one year of experience with SCIS.

Null Hypothesis₂: There are no significant differences between the pre-workshop and post-workshop Stages of Concern of the 1975 Workshop Participants.

The Wilcoxon matched pairs-signed ranks test (Siegel) was used to determine the direction and magnitude of differences in scores at each of the seven stages of the SOC instrument. The results are given in Table 4. The decision was to reject the null hypothesis at the .05 level for three of the seven stages. The results indicated that after completing the workshop the participants had significantly greater concerns at the .05 level with the stages of management, collaboration, and refocusing.

Null Hypothesis₃: There is no significant difference between the pre-workshop and post-workshop scores on the Science and Science Teaching Attitude Scales.

The multivariate analysis of variance was used to test for significant differences between the two groups using the BMDX69 computer program developed at the Health Sciences Computing Facility at U.C.L.A. The multivariate analysis of variance resulted in an approximate F statistic of 1.0425 with degrees of freedom of 8 and 55. The decision was to accept the null hypothesis of no difference at the .05 level of significance. The mean scores for each scale are given in Table 5.

Table 4

Comparison of the Pre and Post Workshop Stages of Concern
Scores of 36 Participants

<u>Stages of Concern</u>	<u>Z</u>	<u>Probability</u>	<u>Direction</u>
0 Unawareness	-1.85	.0644	
I Informational	- .61	.5418	
II Personal	-1.65	.0990	
III Management	-2.37	*.0178	More post workshop concern
IV Consequences	-1.28	.2006	
V Collaboration	-2.14	*.0324	More post workshop concern
VI Refocusing	-3.79	*.00028	More post workshop concern

* Significant at .05 level

Table 5
Mean Scores for the Science and
Science Teaching Scales (N = 32)

Scale	Pre-test Mean	Post-test Mean
2P	12.34	12.94
2N	12.78	12.66
5P	8.94	9.84
5N	13.03	12.63
6P	11.47	11.91
6N	5.55	6.25
7P	13.00	13.13
7N	9.97	10.31

SCIS Institute Reactionnaire. The Reactionnaire given at the end of the workshop provided the following descriptive data as to the degree of usefulness and degree of interest attached to various workshop activities for the 33 respondents.

1. For me, the opportunity to work through the SCIS Life Science Unit that I will be teaching was:

interesting	81.81%,	of some interest	18.19%,	not interesting	0%.
useful	81.25%,	of some use	18.75%,	not useful	0%.

2. I found that teaching SCIS to small groups of students was:

interesting	63.64%,	of some interest	36.36%,	not interesting	0%.
useful	56.25%,	of some use	37.50%,	not useful	6.25%

3. For me, the sessions on wait time, questioning skills, and set induction were:

interesting	36.36%,	of some interest	54.55%,	not interesting	9.09%.
useful	50.00%,	of some use	50.00%,	not useful	0%.

4. I found the field trips to be:

interesting	69.70%,	of some interest	27.27%,	not interesting	3.03%.
useful	50.00%,	of some use	46.88%,	not useful	3.12%.

5. For me, the outdoor laboratory investigations in the yellow booklet were:

interesting	63.64%,	of some interest	33.33%,	not interesting	3.03%.
useful	40.63%,	of some use	56.25%,	not useful	3.12%.

Levels of Use Inventory. After approximately four months of SCIS teaching opportunity, the distribution of Levels of Use of SCIS was determined through the Levels of Use Inventory (LoUI) developed locally by a project staff member.

The distribution of teachers' levels of use are given in Table 6.

Table 6
Levels of Use of SCIS Based
on LOUI (N = 33)

<u>Levels of Use</u>	<u>Number of Teachers</u>	<u>Percent of Teachers</u>
0 Non-Use	2	6.1
I Orientation	5	15.1
II Preparation	0	0.0
III Mechanical Use	17	51.6
IVA Routine	5	15.1
IVB Refinement	3	9.1
V Integration	0	0.0
VI Renewal	1	3.0

Conclusions

During the 1975 four-week workshop the participants engaged in a number of different activities. The post-workshop Reactionnaire indicated that the opportunity to work through the SCIS Life Science unit at a particular grade level was the most interesting and most useful activity encountered. The field trips were ranked second in terms of interest but were ranked lower in terms of usefulness. The category of teaching SCIS to small groups of children was ranked second in terms of usefulness but ranked lower in terms of being interesting.

The results of the Science and Science Teaching Attitude Scales indicated that no significant increase in teacher attitudes were brought about by the Institute. The pre-test means for some of the scales were relatively high given a possible score of 15 for each scale. This test ceiling effect may have contributed to the lack of significance.

The Concerns Questionnaire given prior to the 1975 workshop indicated that the twenty-eight 1974 workshop participants were significantly less concerned than the twenty-eight 1975 participants with regard to: (a) general characteristics and information about the SCIS program, (b) personal demands that SCIS usage would entail, and (c) management problems associated with the SCIS program. The results of this comparison suggested that the previous workshop and one year of teaching experience had reduced the early stages of concerns of the experienced group.

At the conclusion of the workshop the participants had significantly greater concerns regarding: (a) issues related to efficiency, organizing, managing, scheduling, and time demands associated with SCIS teaching, (b) increasing the impact of SCIS on students through collaboration with

other teachers, and (c) exploring more universal benefits from SCIS, including the possibility of major modifications or replacement.

The observational data (LoUI) obtained after approximately four months of SCIS teaching opportunity indicated that 79% of the 33 teachers were using SCIS at the mechanical use level or higher. The seven teachers at levels one or zero were either assigned to non-science teaching responsibilities or indicated that they didn't elect to teach the SCIS material.

Implications

The continuing moratorium on NSF funding of implementation activities serves as a reminder of the importance of continually refining our procedures for assessing the appropriateness of the science workshop experiences that are provided teachers.

The Competency Based Adoption Model (Hall, 1973) represents an approach to most types of innovations that are the subject of teacher workshops or institutes. One of the basic assumptions of this model is that innovation adoption is a process not an event. Adoption requires developmental growth in both an individual's concerns and skill in adapting the innovation.

In the event that we accept the developmental model of change from self concerns to task concerns to impact concerns, we as adoption agents need to find ways to use this information to initiate action to resolve concerns of teachers regardless of the level of sophistication. A recent paper by Hall (1975) reviews the development of the Concerns-Based Adoption Model, outlines the related research evidences and concludes with a discussion of implications for decision-makers.

References

1. Colbert, Joel. Levels of Use Inventory. Unpublished instrument, Lawrence, School of Education, University of Kansas, 1975.
2. Fuller, Frances F. Concerns of Teachers: A Developmental Conceptualization. American Educational Research Journal, 1969, 6 (2), 207-226.
3. Hall, Gene E. The Effects of "Change" on Teachers and Professors -- Theory, Research, and Implications for Decision-Makers. Paper presented at the National Invitational Conference on Research on Teachers Effects: An Examination by Policy-Makers and Researchers. Austin, Texas, November, 1975.
4. Hall, G.E., Loucks, S.F., Rutherford, W.L., and Newlove, B.W. Levels of Use of the Innovation: A framework for Analyzing Innovation Adoption. Journal of Teacher Education, 1975, 26, 52-56.
5. Hall, G.E., Wallace, R.C., and Dossett, W.F. A Developmental Conceptualization of the Adoption Process Within Educational Institutions. Austin, Texas: Research and Development Center for Teacher Education, The University of Texas, 1973.
6. Helgeson, Stanley L. Impact of the National Science Foundation Teacher Institute Program. Information Bulletin, No. 2, 1974-75: 1-18, ERIC/SMEAC, 1200 Chambers Road, Columbus, Ohio.
7. Loucks, S.F., Newlove, B.W., and Hall, G.E. Measuring Levels of Use of the Innovation: A Manual for Trainers, Interviewers, and Raters. Austin, Texas: Research and Development Center for Teacher Education, The University of Texas, 1976. (Note: Currently this manual is only available to prospective researchers who are interested in collaborating with the CBAM Project staff in refining the interview training system.)
8. Moore, Richard W. The Development, Field Test, and Validation of Scales to Assess Teachers' Attitudes Toward Teaching Elementary School Science. Science Education, 1973, 57 (3), 271-278.
9. Moore, Richard W. and Sutman, Frank X. The Development, Field Test and Validation of an Inventory of Scientific Attitudes. Journal of Research in Science Teaching, 1970, 7 (2) 85-94.
10. Rowe, Mary Budd and Hurd, Paul DeHart. The Use of Inservice Programs to Diagnose Sources of Resistance to Innovation. Journal of Research in Science Teaching, 1966, 4(1), 3-15.

11. Siegel, Sidney. Nonparametric Statistics for the Behavioural Sciences. New York: McGraw-Hill Book Company, 1956.

12. Webb, E.J. et al. Unobtrusive Measures: Non Reactive Research in the Social Sciences. Chicago: Rand McNally and Company, 1968.